(U) 5   What is claimed is:

1. An object detection system for detecting and identifying targets including:

    a first module having a plurality of acoustic transmitters configured to generate ultrasonic waves in air in a predetermined direction;

    a second module having at least one acoustic receiver configured to

(U) 10   receive reflected ultrasonic waves originating from the first module after reflection from a target; and

    target identification logic coupled to the second module and configured to generate an output representative of the target.

(U) 15   2. The object detection system of claim 1, wherein the first module includes a plurality of acoustic transmitters and the second module includes a plurality of acoustic receivers.

3. The object detection system of claim 2, wherein:

(U) 20   the acoustic transmitters are positioned in a generally collinear configuration oriented in a first direction;

        the acoustic receivers are positioned in a generally collinear configuration oriented in a second direction; and

        the first direction and the second direction are nonparallel to one another.

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4. The object detection system of claim 3, wherein the first direction is substantially perpendicular to the second direction.

5. The object detection system of claim 1, wherein the target identification logic is configured to reduce background noise in the generated output.

6. The object detection system of claim 1, wherein the target identification logic is configured to reduce reverberation in the generated output.

7. The object detection system of claim 1, wherein the first and second modules are configured to minimize energy received at the second module from directions other than a predetermined direction targeted by the transmitter.

8. The object detection system of claim 1, wherein the second module includes at least a first said acoustic receiver and a second said acoustic receiver wherein the first said acoustic receiver is positioned above the second said acoustic receiver.

9. The object detection system of claim 1, further including feature extract logic

configured to generate signals representative of at least one physical characteristic of the target.

10. The object detection system of claim 1, wherein the first and second modules are configured to reduce energy from directions other than a predetermined direction

targeted by the transmitter.

11. The object detection system of claim 1, further including logic configured to identify targets based upon clusters derived from reflected acoustic waves.

12. The object detection system of claim 1, wherein the produced ultrasonic waves include concatenated waves of different types.

13. The object detection system of claim 12, wherein the interpretation logic is
configured to reduce reverberation in the generated output.

14. The object detection system of claim 12, wherein the first and second modules are configured to minimize energy received at the second module from directions other than a predetermined direction targeted by the transmitter.

15. The object detection system of claim 12, further including logic configured to correlate data of multiple pings to improve the received data.

16. The object detection system of claim 12, wherein the interpretation logic is
configured to provide cluster analysis of over-resolved echo return from a single object.

17. An area detection system including a plurality of object detection systems for detecting and identifying targets, each object detection system including:
a first module having a plurality of acoustic transmitters configured to generate ultrasonic waves in air in a predetermined direction;

a second module having at least one acoustic receiver configured to receive reflected ultrasonic waves originating from the first module after reflection from a target; and

target identification logic coupled to the second module and configured to generate an output representative of the target.

18. The area detection system of claim 20, wherein the generated ultrasonic waves from the respective object detection systems are configured to substantially overlap at a predetermined stand-off range.

19. The area detection system of claim 20, further including integration logic configured to receive the generated outputs from each of the object detection systems and to generate an integrated output representing targets in a predetermined area.

20. The area detection system of claim 22, wherein the integrated logic is configured to eliminate multiple representations of generated ultrasonic waves reflected from a single target.

21. An object detection system including:

a) a first module having a plurality of acoustic transmitters configured to generate ultrasonic concatenated waves of different types in air in a predetermined direction;

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b)   a second module having a plurality of receivers configured to receive reflected ultrasonic waves originating from the first module after reflection from a target;

c)   first logic configured to identify targets based upon clusters derived from reflected acoustic waves;

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d)   second logic configured to minimize energy received at the second module from directions other than a predetermined direction targeted by the transmitter; and

e)   third logic configured to generate signals representative of at least one physical characteristic of the target;

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wherein the acoustic transmitters are positioned in a generally collinear configuration oriented in a first direction, and the acoustic receivers are positioned in a generally collinear configuration oriented in a second direction which is substantially perpedicular to the first direction.

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22.   A method of acoustically detecting objects, the steps including:

generating ultrasonic waves from a set of acoustic transmitters;

transmitting the generated ultrasonic waves through air towards a target;

receiving ultrasonic waveforms from a set of at least one acoustic receiver configured to receive reflected ultrasonic waves originating from the first

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module after reflection from the target; and

processing ultrasonic waveforms with target identification logic coupled to the at least one acoustic receiver and configured to generate an output representative of the target.

(U) 5   23.   The method of claim 22, further including the step of:

determining whether the received ultrasonic waves are false alarms.

24.   The method of claim 21, wherein the ultrasonic waves are received by an array of receivers.

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25.   The method of claim 21, wherein the ultrasonic waves are generated by an array of transducers.

26.   The method of claim 21 wherein the ultrasonic waves are generated by a

(U) 15   single transducer.

27.   The method of claim 22, wherein the step of classifying the received ultrasonic waves includes identifying targets based upon clusters derived from reflected acoustic waves.

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